MOVABLE HIGHWAY SIGN

Reference to Related Application

The present application claims priority to U.S. Provisional Application No. 60/526,158, filed December 2, 2003, and U.S. Provisional Application No. 60/564,424, filed April 22, 2004. The provisional applications are hereby incorporated by reference in their entirety.

Field of the Invention

The present invention relates generally to road signs. More particularly, the present invention relates to movable road signs.

Background of the Invention

Road signs are used in a variety of applications to assist drivers in finding particular locations or to warn drivers about potential hazards and generally providing information. In situations where it is not needed to periodically change the road signs, the text or graphics are permanently affixed to the road sign.

Electronically changeable road signs may include an array of light emitting diodes that may be selectively illuminated to create desired messages.

Alternately, flappable panels may be utilized with or without the light emitting diodes. It will be appreciated that these types of signs provides a significantly greater degree of flexibility than static road signs. Moreover, due to the electronics, overall complexity, and components that have a limited useful life, these signs require significantly more maintenance than the road signs that have static messages.

To assist drivers in viewing the road signs, a preferred location for road signs is directly above a portion of the road on which vehicles drive. This configuration enables drivers to read the messages on the road signs without lateral turning and, as such, is often perceived as being safer than road signs that are on adjacent sides of the road.

When road signs are positioned above the road, tasks associated with maintaining the road signs become more difficult. One option is to temporarily close the portion of the

road under the road sign and access the sign from ladders or mechanized lift equipment from the roadway. This option is undesirable as changes in normal traffic flow patterns often increase congestion on the road and may lead to more accidents.

Another option for maintaining road signs that are positioned over roads is to work on the road signs without interfering with the flow of traffic on the road by having the person doing the maintenance climb up to the road sign from offroad access points. In light of the enhanced danger of a person working over a road that is in use, there are numerous safety precautions that must be followed to reduce the potential of injury to the person and in many locations the roadway below the work area is still required to be closed by law.

This option also potentially increases the risk of damage to vehicles traveling under the road sign if the person performing the maintenance activities was to inadvertently drop parts or tools onto the road.

Certain electronic changeable signs where the sign enclosure is large enough for a worker to enter the enclosure do not require shutting down traffic. These signs, however, are massive in size and weight and may require environmental control such as air conditioning. The weight, size and expense of these make such signs impractical in many locations.

A significant need exists for providing a cost effective means for maintaining signs, and particularly electronic changeable message signs, without interfering with traffic.

Summary of the Invention

The present invention is directed to a movable sign system having a sign module that is mounted to a support structure with a positioning system. The movable sign system is particularly suited for mounting above a road such as on a bridge or existing sign structure. In preferred embodiments, the positioning system translates the sign module horizontally from above a roadway to a position off of the roadway

More particularly, in preferred embodiments, the sign module is movable with respect to the support structure between a use position that is at least partially above the

road to a maintenance position that is adjacent the road. In an alternate embodiment where the sign is attached to a bridge structure, the sign is raised and is positionable to be accessed from the walkway or road surface on top of the bridge. The movable sign system thereby enhances the ability to maintain the sign module without the risks associated with working directly above traffic on a road and without shutting down the traffic.

Description of the Drawings

Fig. 1 is a front elevational view of a movable sign system according to an embodiment of the present invention with a sign module in a use position above a road and a maintenance position adjacent to the road (in phantom).

Fig. 2 is a side elevational view of the movable sign system of Fig. 1.

Fig. 3 is an enlarged view of an upper portion of the movable sign system of Fig. 1.

Fig. 4 is an enlarged view of a lower portion of the movable sign system of Fig. 1.

Fig. 5 is a front elevational view of another embodiment of the movable sign system with a sign module in a use position.

Fig. 6 is a top plan view of the movable sign system of Fig. 5 showing the sign module pivoting between a use position and a maintenance position.

Fig. 7 is a front elevational view of still another embodiment of the movable sign system with a sign module in a use position.

Fig. 8 is a top plan view of the movable sign system of Fig. 7 with the sign module in the use position.

Fig. 9 is a side elevational view of an end plate of the movable sign system of Figs. 7-8.

Fig. 10 is a top elevational view of yet another embodiment of the movable sign system.

Fig. 11 is a front elevational view of another embodiment of the movable sign system where the sign module enables changeable messages to be displayed.

Fig. 12 is a front elevational view of the movable sign system of Fig. 11 that shows a support structure.

Detailed Description of the Invention

The present invention is directed to a movable sign system 10 that is particularly designed for placement at least partially above a road 12, as illustrated in Fig. 1. The movable sign system 10 generally includes a sign module 14 and a positioning system 15 mounted on a support structure 16. The support structure 16 can be attached to a bridge 18, may be the bridge itself, or may be a ground based structure cantilevered over the roadway or supported at both sides and extending over the roadway.

In preferred embodiments, the sign module has a sign surface of at least 30 square feet, has text thereon or is capable of displaying text, said text of a size readable from at least 200 feet away by drivers with average eyesight.

The movable sign system 10 of the present invention enhances the ability to maintain the sign module 14 as the sign module 14 is movable between a use position that is above the road 12 to a maintenance position (in phantom) that is adjacent a side of the road 12. By moving the sign module 14, risks associated with working above a road 12 are eliminated compared to conventional road signs.

The sign module 14 used in conjunction with the present invention preferably has a substantially rectangular configuration with an upper edge 20, a lower edge 22 and a pair of side edges 24 that extend between the upper edge 20 and the lower edge 22. The sign module 14 is preferably powered and may have a sign controller 25 located remote from the sign module 14 and connecting by cables 27.

Examples of particularly suited changeable signs and the associated componentry are disclosed in U.S. Patent Nos. 6,414,650; 6,175,342; 6,150,996; and 5,914,698, which are all assigned to the assignee of the present application. These applications are incorporated herein by reference. It is also possible to use other types of changeable electronic signs in conjunction with the concepts of the present invention.

The positioning system 15 includes a guide portion and a drive portion. The guide portion in one embodiment includes a first cooperating portion attached to the support structure configured as an upper rail 40 and a lower rail 42, as most clearly illustrated in Figs. 2-4. The upper rail 40 and the lower rail 42 each may have a recess or other engagement means formed therein that is adapted to receive a second cooperation portion mounted on the sign module 14 and configured as wheels 44 .

The upper rail 40 and the lower rail 42 are preferably sufficiently long so that the sign module 14 is positioned substantially above the road 12 when in the use position and adjacent a side of the road 12 when in the maintenance position. This configuration enables maintenance to be performed on the sign module 14 without the person performing the maintenance being above the road when performing such maintenance.

In another embodiment, the sign module may ride on rails, attached to the support structure, by way of polymer bearings such as bearings made of high density polyethelene. The rails would be the first cooperating portion and the fixed bearings would be the second cooperating portion. Whereby the sign module is slidingly engaged with the rails and whereby the sign module slidingly moves with respect to the support structure by way of the guide portion.

The positioning system 15 also includes the drive portion such as a powered drive system having a cable 50 that extends around a pulley 52 and a portion of a motor 54 that are both mounted to the support structure 16. An alternative drive portion could include pneumatic or hydraulic cylinders. An alternate embodiment could be a chain drive 54. Another embodiment could be a screw drive with the threaded shaft extending out over the roadway and engaged at the sign module with a nut attached thereto such that as the shaft is rotated, manually or by powered drive, the sign module is moved as desired. Manually driven systems may be suitable in some locations and may utilize, for example, hand cranks.

In an alternative embodiment of the present invention, the movable sign system 110 includes a sign module 114 that is pivotally mounted to a support structure 116, as illustrated in Figs. 5 and 6. This embodiment of the movable sign system 110 is particularly suited for relatively narrow areas where it is not possible to slide the sign

module 114 to a position adjacent the road as is described in the embodiment illustrated in Figs. 1-4.

The sign module 114 used in this embodiment may have a variety of configurations such as is discussed above with respect to the embodiment illustrated in Figs. 1-4.

Depending on the size of the sign module 114, it is preferrable to use motor 115 and power driven systems when moving the sign module 114 from the use position (114a) to the maintenance position (114b), as indicated by arrow 120.

In another embodiment of the present invention, the movable sign system 210 includes a sign module 214 that is mounted for rotation with respect to a positioning system 216, as illustrated in Figs. 7-8. This embodiment of the movable sign system 210 is particularly suited for use with a bridge 218 that extends over the road. The sign module 214 preferably translates vertically and then rotates, swings, or moves horizontally to allow service from on top of the bridge.

The sign module 214 used in this embodiment may have a variety of configurations such as is discussed above with respect to the embodiment illustrated in Figs. 1-4.

The support structure 216 includes at least two members that are each vertically moveable with respect to a side of the bridge 218 proximate opposite edges of the sign module 214. In their most simplistic form, the end members 240 each have an aperture formed therein.

The sign module 214 connects to the positioning system 216 by extending bolts 244, pins, or similar devices through the apertures and into the sign module 214. The end members 240 may telescope with the lower members 215 or may be slidingly mounted thereto, or may otherwise be mounted such that the sign moves from the use position 246 to the maintenance position 245.

Mounting points on the sign module 214 are preferably proximate a middle of the sign module 214 so that the sign module 214 is approximately equally weighted above and below the mounting points. Arranging the mounting points in this manner makes is

relatively easy to manually move the sign module 214 from the use position to the maintenance position.

In contrast to the preceding embodiments of the movable road sign where the sign module remains in an upright orientation in the use position and the maintenance position, in this embodiment, the sign module 214 shifts from an upright orientation in the use position to an upside down orientation in the maintenance position when rotated as indicated by arrow 250.

Depending on the difference of height between the use position and the maintenance position, it is also possible to form the end members 240 with a vertically oriented slot 260, as illustrated in Fig. 9. When in the use position, the sign module 214 is proximate a lower end of the slot 260. When in the maintenance position, the sign module 214 is proximate an upper end of the slot 260.

Because the configuration of the movable sign module 214 in Figs. 7-9 would require raising and lowering of the sign module 214, this embodiment preferably includes a mechanical assistance mechanism (not shown) to move the sign module 214 from the use position to the maintenance position.

In still another embodiment of the present invention, the movable sign system 310 has a sign module 314 that has a positioning system 315 mounted for shifting with respect to a support structure 316 as indicated by arrows 360, such as is illustrated in Fig. 10.

The sign module 314 used in this embodiment may have a combination of the configurations such as is discussed above with respect to the embodiment illustrated in Figs. 1-4. For example, the sign module may be translated horizontally off of the roadway and then may be lowered to proximate the ground by pivoting links, sliding members, or other translating means described herein. The translating means that are shown operating horizontally can operate vertically and vice versa.

The support structure 316 includes a first side member 340 and a second side member 342. The first and second side member 340, 342 each preferably include an upper connection point 344 and a lower connection point (not shown).

The sign module 314 is preferably connected to the positioning system 316 with a pair of upper elongate members 350 and a pair of lower elongate members (not shown). A first end of the upper elongate members 350 is pivotally attached to the upper connection point 344 on the first and second side members 340, 342. A second end of the upper elongate members 350 is pivotally attached to the upper edge 320 proximate opposite ends of the sign module 314.

Similarly, a first end of the lower elongate members is pivotally attached to the lower connection point on the first and second side members 340, 342. A second end of the lower elongate members is pivotally attached to the lower edge 322 proximate opposite ends of the sign module 314.

Depending on the size of the sign module 314, it is possible to use mechanical assistance (not shown) when moving the sign module 314 from the use position to the maintenance position. Such suitable devices would include hydraulic cylinders, pneumatic cylinders, chain drivers, gear drivers, cables, etc.

Another embodiment of the movable highway sign 410 that generally includes a sign module 414, a positioning system 415 and a support structure 416, as generally illustrated in Figs. 11-12. The sign module 414 used in conjunction with this embodiment has a sign housing 419 and a face 420 with a plurality of light elements exposed therethrough that are selectively illuminated to form a message on the sign module 414.

The support structure 416 has a truss 430 spanning over the roadway and between the support posts 434. The positioning system 415 has a guide portion 440 comprised of a first cooperating portion configured as horizontal elongate members 442, preferably steel rods or tubes, that are fixed in place on the truss. Second cooperating portions are configured as guide members 450 having polymer bearings 452 positioned therein to slidingly engage the elongate members. A drive portion 458 is comprised of a motor portion 462 and a threaded drive rod 466 rotatably mounted to the truss. On the sign module, a nut 472 fixed to the back of the module engages with the threaded drive rod. When the motor portion rotates the drive rod the sign moves along a horizontal path-of-travel 478 guided by the elongate members and is movable between the use position 480 and a maintenance position 484. Moreover, an additional sign 490 as illustrated by the dashed lines on Fig. 12 could face the opposite direction of the other sign. The positioning

system is capable of positioning the two-way sign in the appropriate position over the road.

It is contemplated that features disclosed in this application, as well as those described in the above applications incorporated by reference, can be mixed and matched to suit particular circumstances. Various other modifications and changes will be apparent to those of ordinary skill.